REMARKS

In Section 2 of the Office Action, claims 1-20 were rejected under 35 U.S.C. §103(a) as being unpatentable over Carney et al., U.S. Pat. No. 5,937,011 (hereinafter referred to as Carney) in view of Kafadar et al., U.S. Pat. No. 5,321,726 (hereinafter referred to as Kafadar). The rejection of these claims is respectfully traversed for the reasons provided below with reference to the rejection of specific independent claims.

Claim 1 recites a quadrature modulator compensation system for compensating the transmission of a source signal provided by a signal source data generator. The quadrature modulator comprises a transmitter which translates a baseband transmitter input signal to a local oscillator frequency to generate a transmitter output signal. The recited quadrature modulator compensation system also comprises "calibration circuitry coupled to the transmitter and generating a phase error estimate of the transmitter as a function of an angle of intersection between a desired transmitter envelope and an actual transmitter envelope." Finally, as recited in claim 1, the quadrature modulator comprises "predistortion circuitry coupled to the signal source, the transmitter and the calibration circuitry, the predistortion circuitry receiving the source signal and the phase error estimate of the transmitter as inputs and providing as an output the transmitter input signal as a function of the phase error estimate of the transmitter".

In support of the rejection of claim 1, the Office Action stated that Carney discloses a predistortion detection technique comprising "[c]alibration circuitry . . .coupled to the transmitter which receives a correction signal from the predistortion processor and source signals (121) to generate an error estimate of the transmitter." Next, the Office Action states that Carney's predistortion technique also comprises "[p]redistortion circuitry [that] receives the source signal (121) and uses the phase error estimate of the transmitter as an input and provides as an output the transmitter input signal as a function of the phase error estimate." Next, the Office Action admits that Carney does not disclose in the calibration circuitry the use of an angle of intersection between a desired transmitter envelope and an actual transmitter envelope in the generation of a phase error estimate, nor does it include a quadrature compensation system. However, in order to address this gap, the Office Action relies upon Kafadar, stating that this patent teaches a "Phase-Shift Keying (PSK) modulation system having a quadrature calibration of a vector demodulator

using a statistical approach for analysis and correction of received data." The Office Action concludes that "[i]t would have been obvious . . . to incorporate Kafadar's quadrature modulator teachings into Carney's modulator correction system because PSK is an efficient modulation scheme for digital transmission." The Examiner's rejection of claim1 is respectfully traversed for the following reasons.

Although there is no teaching or suggestion to combine Carney and Kafadar, no combination of these two references renders claim 1 obvious. As noted above, the Office Action acknowledges that Carney does not teach that a phase error estimate is generated as a function of an angle of intersection between a desired transmitter envelope and an actual transmitter envelope. However, in disagreement with the assertions made in the Office Action, it must be understood that Carney is also silent as to the calibration circuitry generating a phase error estimate of the transmitter in any manner. Kafadar also does not provide any such teaching.

The predistortion circuitry of Carney, as described in Col. 4, line 9 through Col. 5, line 33, discloses three methods to correct the amplitude offset through the use of a dummy load, a calibrated tone and calculated offset values. Carney is silent, however as to the use of phase error estimate of the transmitter as an input and providing as an output the transmitter input signal as a function of the phase error estimate. In the PSK demodulation methodology disclosed by Kafadar, it is stated that various conditions such as gain imbalance, DC offsets and phase differences contribute to signal loss (Col. 1, line 17-31). However, Kafadar is also silent as to the use of predistortion circuitry that receives the source signal and uses a phase error estimate of the transmitter as an input, further providing as an output the transmitter input signal as a function of the phase error estimate, as required by claim 1 of the present invention. Consequently, both Carney and Kafadar fail to teach or suggest (1) that calibration circuitry generate a phase error estimate of the transmitter; (2) that the calibration circuitry generate the phase error estimate as a function of an angle of intersection between the desired transmitter envelope and an actual transmitter envelope; and (3) that predistortion circuitry provides the transmitter output as a function of the phase error estimate of the transmitter. Lacking any one of these claim requirement prevents a combination of Carney and Kafadar from rendering claim 1 obvious.

Since these references fail to teach any of these claim requirements, they even more clearly fail to render claim 1 obvious. Since claims 2-9 depend from independent claim 1, these claims are patentable over the cited combination for these reasons in addition to the further limitations found in these claims.

Independent claim 10 is directed to a method of compensating transmission of a source signal in a quadrature modulator. Among others, the method includes the step of "determining a phase error estimate of the transmitter as a function of an angle of intersection between the desired transmitter envelope and the actual transmitter envelope." The method also includes the step of predistorting the source signal to generate a transmitter input signal, "wherein the transmitter input signal is generated as a function of the source signal and the determined phase error estimate." The Office Action provided no analysis in support of the rejection of method claim 10, other than stating that this claim contains all of the limitations of apparatus claim 2. Nevertheless, in view of the arguments provided in support of independent claim 1, it is clear that these steps of independent claim 10 are neither taught nor suggested by the cited combination or references. Since claims 11-14 depend from independent claim 10, these claims are patentable over the cited combination for these reasons in addition to the further limitations found in these claims.

Independent claim 15 is directed to a quadrature modulator compensation system for compensating the transmission of a source signal. As recited in claim 15, the system includes calibration circuitry coupled to a transmitter and "configured to generate at least one of a phase error estimate of the transmitter as a function of an angle of intersection between a desired transmitter envelope and an actual transmitter envelope, a gain error estimate of the transmitter as a function of variation in the actual transmitter envelope, and a dc offset estimate in an in-phase component and a quadrature component of the source signal as a function of a centroid of the actual transmitter envelope." Finally, claim 15 recites "predistortion circuitry receiving the source signal and at least one of the phase error estimate, the gain error estimate, and the dc offset estimate as inputs and providing as an output the transmitter input signal as a function of at least one of the phase error estimate, the gain error estimate, and the dc offset estimate."

The Office Action provided no analysis in support of the rejection of claim 15, other than stating that this claim contains all of the limitations of apparatus claim 6. Nevertheless, since both Carney and Kafadar are silent as to predistortion circuitry receiving at least one of a calibration circuitry generated phase error estimate, gain error estimate, or dc offset estimate as inputs and providing as an output the transmitter input signal as a function of the at least one of the calibration circuitry generated phase error estimate, the gain error estimate, and the dc offset estimate, it is submitted that the combination of steps recited in independent claim 15 are neither taught nor suggested by the cited references. Since claims 16-20 depend from independent claim 15, these claims are patentable over the cited combination for this reason in addition to the further limitations found in these claims.

Applicants submit that the claims are patentably distinguishable from the prior art and respectfully request favorable action and allowance.

The Director is authorized to charge any fee deficiency required by this paper or credit any overpayment to Deposit Account No. 18-1722.

Respectfully submitted,

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